

**VERTICAL CONDUCTION FLIP-CHIP DEVICE WITH
BUMP CONTACTS ON SINGLE SURFACE**

ABSTRACT OF THE DISCLOSURE

A flip-chip MOSFET structure has a vertical conduction semiconductor die in which the lower layer of the die is connected to a drain electrode on the top of the die by a diffusion sinker or conductive electrode. The source and gate electrodes are also formed on the upper surface of the die and have coplanar solder balls for connection to a circuit board. The structure has a chip scale package size. The back surface of the die, which is inverted when the die is mounted may be roughened or may be metallized to improve removal of heat from the die. Several separate MOSFETs can be integrated side-by-side into the die to form a series connection of MOSFETs with respective source and gate electrodes at the top surface having solder ball connectors. Plural solder ball connectors may be provided for the top electrodes and are laid out in respective parallel rows. The die may have the shape of an elongated rectangle with the solder balls laid out symmetrically to a diagonal to the rectangle.